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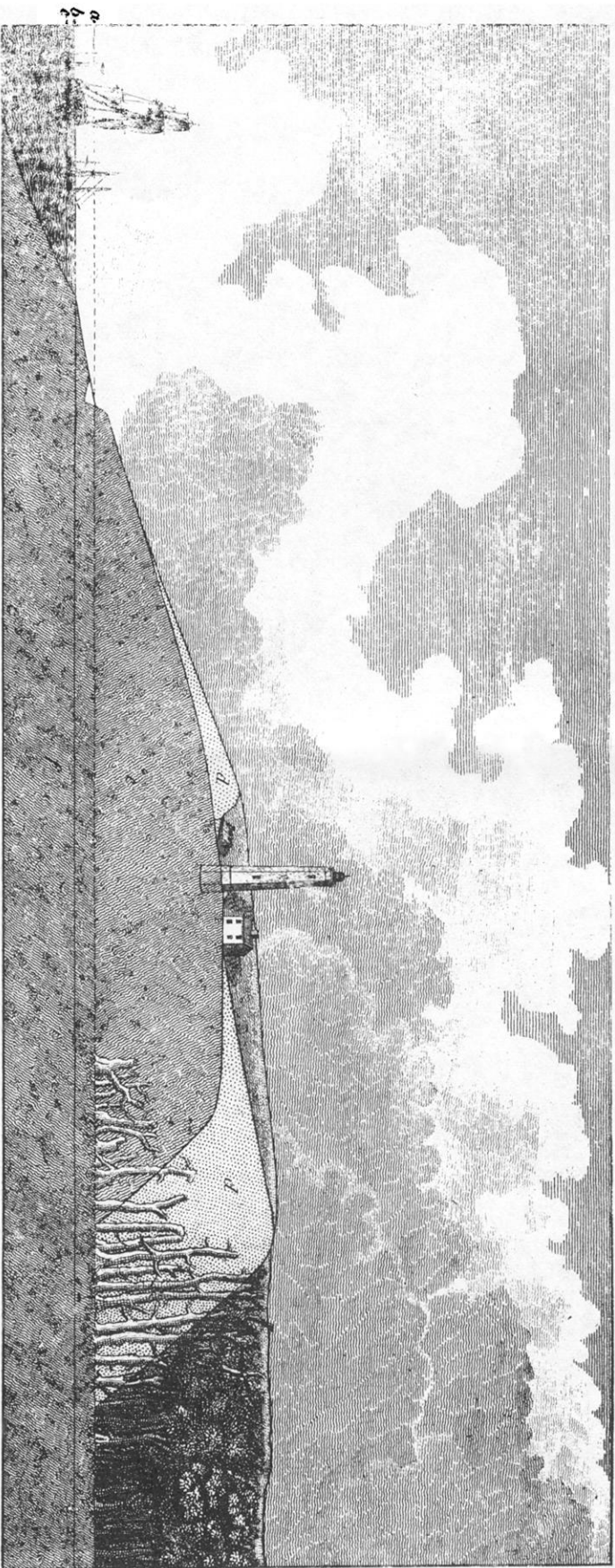
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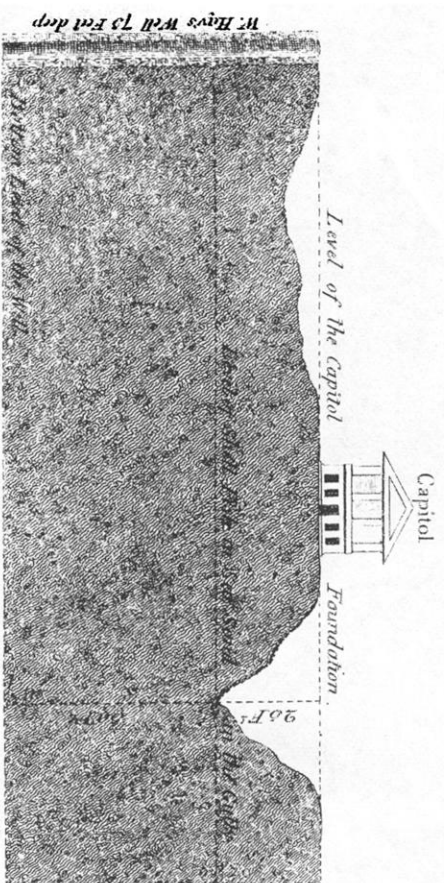
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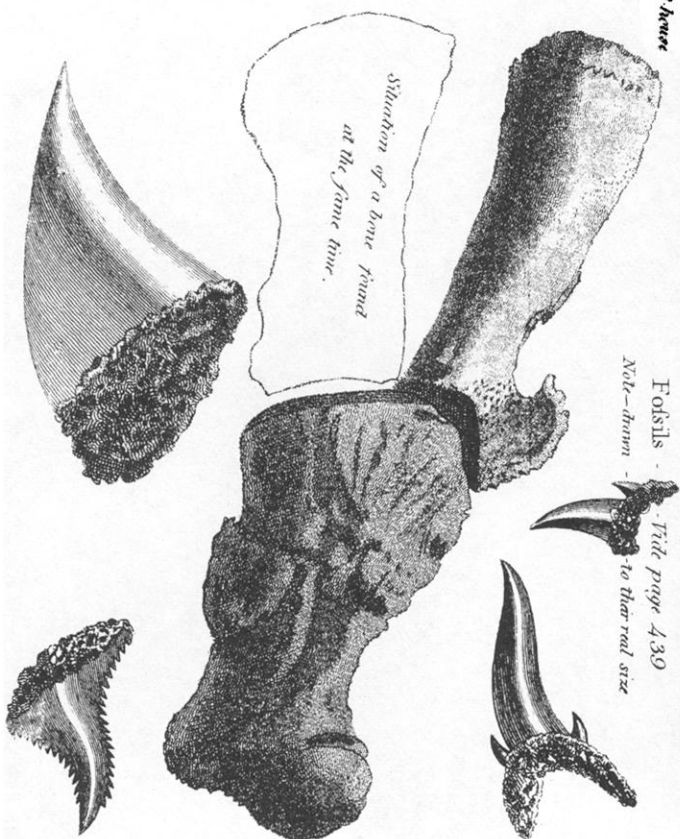
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Section of the Coast of Virginia at Cape Henry.

Lathrobe Del.

A. on this side the gully produces as on the other Side at - - - A



*Situation of a bone found
at the same time.*

No. LXVIII.

Memoir on the Sand-hills of Cape Henry in Virginia.
By B. HENRY LATROBE, Engineer.

December 19th, 1798.

Read, Dec. 21, 1798. **F**ROM the falls of the great rivers of Virginia over the out-runnings of the granite strata, the general level of the land gradually approaches the level of the ocean. At the falls it is elevated from 150 to 200 feet above the tide: on the sea shore at Cape Henry, the original coast rises not more than 15 feet above high water mark.

That the whole of this extensive country, from the falls to the coast, is factitious, and of Neptunian origin, appears far from being hypothetical; and the fossil teeth and bones, which accompany this memoir,* and which with many hundred more, were dug out of a well at Richmond, from the depth of 71 feet, prove that the deposition of the superstrata is not of a date sufficiently removed to have destroyed the soft and almost cartilaginous part of the joints,
or

* The teeth appear to be those of a shark. They are highly enamelled and extremely sharp: their roots are perfectly sound and entire, and the minute and almost transparent jags of many of them are as perfect as the rest. They are found in every well, dug in or near Richmond, to a sufficient depth; and, as I am informed, in every deep well for many miles below the city. The stratum in which they lie consists of highly sulphurated blue clay, abounding in pyrites, and which has the appearance of having been mud. They were first discovered in the beds of rivulets, which had worn their channels to the depth of this stratum; and obtained the name of *Indian Dart-points*, in the same manner, as the immense oysterbeds, which have been quitted by the ocean, are vulgarly called *Indian oyster-banks*.

The bones were dug from the same stratum. Among them are two out of six bones, which formed a *paw* of some animal unknown to me. Many very sound vertebræ of fish. and a remarkably perfect thigh bone of a large bird have been in my possession.

or to have injured the enamel of the teeth. The Neptunian theory of geogeny, has now very generally taken place the old volcanic system, and, as far as conjecture and hypothesis can forward science, it is certainly more generally applicable. But along the coast of Virginia,* a process is going forward, the result of which will be exactly similar, and in which water has no immediate share.

The shore, and the bed of the Atlantic near the shore, consist of a fine sand. The daily action of the flood tide carries a certain quantity of this sand above high water mark, which being dried by the sun and air, is carried further in land by the winds. The most violent winds on this coast, blow from the points between the N. West and the East; and besides, a gentle easterly breeze prevails the whole summer, during some part of almost every day. This easterly wind, which is in fact a trade wind, is felt as high as Williamsburg. It is said to be felt, at this day, higher in land than formerly, and to be annually extending its influence; and it will no doubt, when the woods shall be more cleared away, blow health and coolness over a portion of lower Virginia, which is now considered as extremely unhealthy.

These easterly winds blowing during the driest and hottest season of the year, carry forward the greatest quantity of sand, and have amassed hills, which now extend about a mile from the beach. The natural level of the land, elevated little more than 10 feet above high water mark, has a very gentle declivity to the east. It is now a swamp† of about

* I speak only of the coast of Virginia at Cape Henry: for although I have the best reason to believe that the same natural process has produced all the sand banks, islands, and sand hills from the Delaware to Florida: I have only *examined* that part of the coast, which is the subject of the present memoir.

† By a swamp I exclusively mean a piece of ground, the surface of which is wet and soft, but which has a sound bottom. In this it differs from the *Dismal* swamp, much of which is a *bog* or *morass*. Into the latter, a pole of any manageable length may be forced with great ease.

about five miles square (25 square miles.) The soil below the surface, is a white loamy sand, and if the water falling upon, or rising in it, had a free discharge to the ocean, it would probably be perfectly dry: this, however, the sand hills prevent, and the water is discharged into the sea to the southward, and into the mouth of the Chesapeake to the northward, by small creeks, which find vent from the westerly extremities of the swamp. Lynhaven creek is the most considerable of these drains. The swamp, or as the neighbouring inhabitants call it, the Desert, is overgrown with aquatic trees and shrubs; the gum, (*L. styraciflua*) the cypress (*cup. disticha*) the maple (*acer rubrum*) the tree improperly called the sycamore (*platanus occidentalis*) the magnolia glauca, the wax myrtle (*myrica cerifera*) and the reed (*ar. tetra*) are the principal. Of these many thousands are already buried in the sand, which over-tops their summits, and threatens the whole forest with ruin. Their destruction is slow, but inevitable. Upon the extreme edge of the sand hills towards the swamp, the wind opposed by the tops of the trees, forms an eddy: the sand carried along with it is precipitated, and runs down the bank into the swamp. Its slope is very accurately in an angle of 45°. By gradual accumulation, the hill climbs up their trunks, they wither slowly, and before they are entirely buried, they die. Most of them lose all their branches, and nothing but the trunk remains to be covered with sand, but some of the cypresses retain life to the last.*

The Desert abounds in deer, bears, racoons, and opossums. Its skirts are more thickly peopled than the sterility

3 M

of

* That the swamp with its trees extended to the sea coast, perhaps *within* a century, is very evident from this circumstance: between the summit of the sand hills (see the drawing) and the sea shore, and more especially on the Chesapeake side, the undecayed, though mostly *dead* bodies of trees still appear in great numbers. Being on the windward side of the sand hills, they have not been more than half buried. At the light house there are none of the trees, (see the section) but to the westward and southward are many.

of the soil would give reason to suppose; but the inexhaustible abundance of fish and oysters in the creeks, and the game, render it easy to support a family.

The light house,* which was built about sixteen years ago, is an octangular truncated pyramid of eight sides, rising 90 feet to the light, and sunk 18 feet below the basement course. Within a few yards of the light house, is the keeper's dwelling, a wooden building of two stories. Both are surrounded by a platform of plank, and, without any such design in the architect, this platform has preserved both these buildings from being buried in the sand.

When the light house was built, it was placed upon the highest sand hill at the Cape. Its distance from the beach may be 6 or 7 hundred yards, and the elevation of its base above high water, not less than 90 feet. At that time there was from the foot of the building, the most expanded view of the ocean, the Desert, the Chesapeake and its eastern shore. At present, a mound of sand surrounds them, which overtops the keeper's dwelling, and has buried his kitchen to the eaves. The platform, which was laid upon the former level of the sand, is an accurate standard from whence to ascertain its accumulation. The winds meeting in their course the elevated tower of the light, form a perpetual whirl around it, which licks up the sand from the smooth surface of the timber, and heaps it around in the form of a basin. Where the platform ceases, the sand accumulates. The sandy rim, while it protects the keeper from the storms, renders his habitation one of the dreariest abodes imaginable. This rim is sometimes higher, at
others

* It is a good solid building of Rappahannoc freestone, but has the unpardonable fault of a wooden stair case, which being necessarily soaked with oil, exposes the light to the perpetual risk of destruction by fire. Such an accident might be attended with an incalculable loss of lives and property, the mouth of the Chesapeake being perhaps the inlet to more ships than any other in the United States.

others lower, according to the direction and strength of the wind. Since the establishment of the light, the hills have risen about 20 feet in height (measuring from the platform) and have proceeded into the Desert about 350 yards, from a spot pointed out to me by the keeper. I stepped the distance as well as I could, while at every step I sunk up to my ancles into the sand. The height of the hill at the swamp, is between 70 and 80 feet perpendicularly. It is higher nearer the sea, the inner edge being rounded off, and I think at its highest point, it cannot be less than 100 feet above high water mark. If the hills advance at an equal ratio for 20 or 30 years more, they will swallow up the whole swamp, and render the coast a desert indeed, for not a blade of grass finds nutriment upon the sand.

Should this event take place, and some future philosopher attend the digging of a well *in the high sandy country, on the coast of Virginia*, his curiosity would be excited by fossil wood, 100 feet below the surface. He would there discover a bed of vegetable and animal extrivæ, and going home, he might erect upon very plausible ground, a very good-looking hypothesis of a deluge, sweeping the whole upper country of its sand, and depositing it along the line of its conflict with the waves of the ocean.

B. HENRY LATROBE.

TO SAMUEL HARRISON SMITH, Esq.
one of the Secretaries of the American
Philosophical Society.

P. S. The annexed drawing is a section of the Cape, in a direction N. E. and S. W. The scale is of course unequal, but the effect is true.

No. LXIX.

Supplement to MR. LATROBE'S Memoir.

Read, Jan. 18, 1799. **T**HE following notices were put into my hands, a few years ago, by an ingenious friend* of mine. They will, I think, form a very proper supplement to Mr. Latrobe's paper, lately communicated to the Society.

BENJAMIN SMITH BARTON.

January 18th, 1799.

“ I. The country below the Falls of James-River, in Virginia, is evidently an acquisition through the recess of the sea. The mean distance from thence to the sea is now one hundred miles. For demonstrative evidence, see the gully in front of the eastern door of the *Capitol*, about twenty feet below the level of *its* foundation, having the appearance of blue clay, but on examination will be found to be sea sand, containing scolop, oyster, clam, English cockle, and various other shell-fish in their natural position, without any evidence of their removal by hand, universal convulsion, or separation of the upper and under shell. See also (the same level perhaps) in the road between Mr. Selden's and Mr. Banks's plantations descending the hill to the New Bridge, six miles from the capitol, for the same evidence.

“ II. The wells of Dr. McClurg, W. Hay, Esq. and Samuel Swan, all on spurs of the same hill, where the Capitol stands, contain at a depth from 50 to 75 feet (being many feet below the above-recited horizon) proofs of universal convulsion, such as the bones of marine and terrestrial animals, birds, fishes, &c. with some works of art, mixed promiscuously in a blue sea-sand (of hepatic quality perhaps). See the following Section.”

Account

* Colonel William Tatham.